```
**********************************************************************
*                                                                    *
*          QQQQQQQQ        ZZZZZZZZZZ      XX      XX                *
*         QQQQQQQQQQ       ZZZZZZZZ        XX    XX                  *
*         QQ      QQ             ZZ         XX XX                     *
*         QQ      QQ           ZZ           XXX                       *
*         QQ      QQ         ZZ             XXX                       *
*         QQ    QQ QQ      ZZ               XX XX                     *
*         QQQQQQQQQQ       ZZZZZZZZ        XX    XX                  *
*          QQQQQQQQ        ZZZZZZZZZZ      XX      XX                *
*                QQ                                                  *
*                                                                    *
**********************************************************************
```

The Journal Covering Amateur Radio & Sinclair Computers
ZX-80; Micro-Ace; ZX81; T/S 1000, 1500, & 2068
2025 O'Donnell Drive
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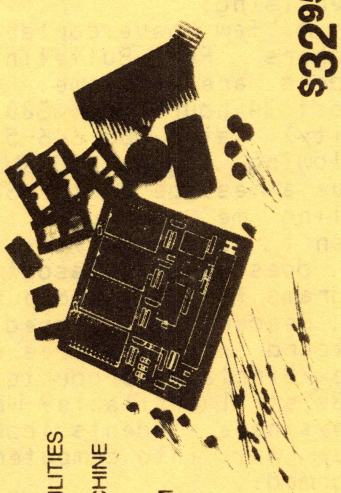

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➧ *READ THE REVIEWS:*

What a super product!... conceived and executed very nicely ...and with quality components. **(SYNTAX QUARTERLY Winter 82)**

8K Nonvolatile memory is a gem! It has so many possible uses. I recommend this board most heartily. **(OKLAHOMA S.U.G. Newsletter 1/3)**

We found the documentation to be far superior to that (of) most hardware we've received. **(S.U.N. Newsletter Nov/Dec 82)**

For versatility this is even better than an EPROM...ranks quite high on the list of "must-haves"... **(SYNC Magazine Mar/Apr 83)**

Provides the user with instant software ...an extremely versatile memory extension. **(Z-WEST June 83)**

INTRODUCTION

This memory board is designed to fill the transparent 8K block of memory (from 8K to 16K) in a ZX81-16K system. This area of memory is an ideal place to store, either permanently or temporarily, machine language routines or data which are to be used by the BASIC system.

Sample utilities are included with the kit.

The use of HM6116LP 2K CMOS RAM memory IC's with their own reserve power supply means that routines stored in the RAM are nonvolatile — the RAM retains its memory even when the ZX81 is switched off or reset. Moreover, being RAM, the routines you store in the memory are easily modified. The lithium cell supplied with the board will maintain sufficient reserve power for almost ten years.

ASSEMBLY

Complete step-by-step instructions in a 20 page manual make assembly of the board easy. The kit (pictured above) is complete with a silkscreened solder-masked printed circuit board, all capacitors, resistors, transistors, sockets, connectors, integrated circuits, and the lithium cell. The board is supplied with one 2K CMOS 6116LP-3 RAM — it will accomodate three more for a total of 8K.

Complete kit with one 2K 6116LP-3	$32.95
Additional three 6116LP-3	$16.00 ~~$16.00~~
Bare pc board & manual	$13.05
Kit for EPROM use only	$22.95
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Shipping & handling per order	$ 1.95

Send check or money order to the address below.

HUNTER, 1630 FOREST HILLS DRIVE, OKEMOS, MI 48864

SPECTRUM EMULATION
Alex. F. Burr K5XY

Our T/S 2068 is closely patterned after the Sinclair Spectrum. In fact some Spectrum software will run on the T/S 2068 with no changes. However, there are some differences between the two ROM's; enough that they are not totally compatible. Because the Spectrum has become one of Europe's most popular computers, a large amount of software has been written for it. This software is becoming more available on this side of the Atlantic. Therefore several schemes have been developed to make the T/S 2068 emulate in every respect the Spectrum.

There are three main schemes to do this emulation. The first and most elaborate, is referred to as the Chameleon. There are two models in two sizes and two degrees of flexibility. The unit contains a 27128 programed EPROM and assorted other components which are placed on a circuit board which fits into the command cartridge port of the T/S 2068. The small one fits entirely inside, the larger one extends out. This arrangement will run from 95 to 98% of all Spectrum software. More information about this system can be obtained from Douglas Dewey at Enter Lengua, 206 James St., Carrboro, NC 27510. (SASE please). WA6DLI says he has been using this system for quite a while with excellent results.

Another method is an ingenious magnetic switching arrangement which substitutes a Spectrum ROM for the T/S 2068 ROM. In this modification the T/S 2068 ROM is removed and placed on a circuit board with a Spectrum ROM. There is a switching mechanism to place the desired one of the two ROM's in active use in the computer. This switch is operated by a magnet from the keyboard. More information can be obtained from G. Russell Electronics, RD1 Box 539, Centre Hall, PA 16828.

The simplest method is just to get a Spectrum ROM and substitute it for the T/S 2068 ROM. Of course, you will then have trouble with T/S 2068 software. One source of Spectrum ROM's is Foote Software, Box 14655, Gainsville, FL 32604.

Of course, putting in a new ROM will not a Spectrum make. (although Spectrum software will run. See advertisements in this issue for Spectrum RTTY programs.) There is still the matter of external connections. The rear connector of the T/S 2068 and the Spectrum are not identical; although there is a great deal of similarity. Another article will give details of the signals which appear on this connector.

Elsewhere in this issue is an excellent article on how to construct a Spectrum Emulator. We are grateful to the editor of **SUM Sinclair/Timex Users Magazine**, Joe Williamson for permission to reprint this information.

Editor's Doings - W4GHV

Not much exciting to report, except that I'm late as usual. I actually got paid for the contract I FINISHED, so back to my hobbies I go. Its a shame when one's work has to interfere with his hobbies.

Word comes from KA2LHO, Kraig who has been by far **QZX**'s biggest contributor that he is 'fresh out of ideas'. Now, this guy is preparing for his Masters' Orals, has made it through college for years, and he says he's out of ideas! I bet he just wants to see **QZX** go under for lack of excellent articles to publish! So, we are depending on all the frustrated, incompetent programmers out there to send in ideas for Kraig!

I want to apologize for the poor print quality of his program in the January issue, I think even his Timex printer is out of gas! The copy was pretty weak to begin with and the printer did their best to bring it back to life. If the program was of interest to you I hope you wrote him for a copy of it on tape. Sorry for the inconvenience.

In the same issue of **SUM** Magazine as the Spectrum Emulator article was an ad from **Skipper Electronics, Inc.**, 3708 Newberry Road, Gainesville, Fla., 32607 for some nice bargains. They have programs (1000/1500) starting at $1, 2068 programs from $11.95, printer paper (dark print) @$6.95, 16K RAM packs @ $14.95, edge connectors, power supplies, and more. You may want to contact them for details. Tell them you read their FREE ad in **QZX**. I doubt if they will know what you are talking about unless we write them and try to talk them into advertising!

A few have contacted **QZX** through Teachers Pet Bulletin Board and all readers are welcome. It's available almost 24 hours now, 300 baud (8 bits, no parity) at 505-646-5194. Use the following logon: JOURNAL;QZX/W4GHV and leave a message to the SYSOP (me, W4GHV) telling me you used the system. It doesn't have any Timex 'stuff' on it yet but does have an assortment of download programs for other computers.

Readers are urged to drop us a postcard with sources of bargains for Timex/Sinclair products. Are 1500s or 2068s still available? Where? How much? I always have students looking for a super cheap way into computers, so keep us informed.

QZX FRIENDS

K6EEU -- Clifford is a tech who hopes to upgrade in a few months. He has a T/S 2068, a modem, a cassette player, and a printer.

OH0NC -- Sam writes that he has two ZX-81's. Both have an EPROM buit-in, one with a RTTY program and the other with a CW program for up to 1250 LPM (250 WPM)

MS work. He is also using the QSAVE program without any extra amplifiers. The clue is to use a hi-fi type cassette deck. The program is recorded via the phono input at max. level while the output from the phones jack is adjusted to provide about 0.8 VAC. He would like to build a RAM up to 24 or 32K with the new Hitachi 6264 CMOS IC or possibly the Texas TMS-4416 DRAM. Does anybody have a schematic? The reason is that the -5V inverter gives too much QRM. Without it there is no QRM from the computer, He's new to QZX but would like to see those ZX-81 programs coming. There is no intention to switch to the Spectrum.

KA2LHO -- Kraig writes that he has just got a Gorilla Banana printer for a little over $100 from DAK Elecronics in California and for that price it is not bad (it has no decenders). It is easier to use with the MEMOTECH interface than the Brother EP-44 but it comes nowhere near the quality of the Brother. I have the Tasman RS-232 interface for the 2068 and so far have been very pleased with its performance and versatility. Another neat program/utility I got a while back but have just recently put to use is the TASPRINT software print styler. It gives double sized characters in five different printer fonts. It is kind of handy for posters or different types of printing needs.

WD0DCU -- Anthony writes that he thinks the 16 K dynamic RAM chip which Radio Shack is selling along with a board which is a match for it would make a good memory expansion unit. He hopes that somebody will build a unit up and describe it here.

John Roland writes to say that he has had success with wiring up the old TI keyboard which Radio Shack now has on sale for only $2.90. (One of the true bargains now available). He also says that he thinks the station controller using the ZX-81 which appeared in the QST ads was not worth the three dollars asked for it.

UNCLASSIFIED ADS

WANTED: UNCLASSIFIED ADS for publication in QZX. Cost is 1 cent for each keystroke (characters, blanks, etc.). Payment must be included with order. This is an excellent way to sell your program or unwanted equipment, ask for help, or find a specific program. Send your ad with payment to QZX, 2025 O'Donnell, Las Cruces, NM 88001.

FOR SALE: ZX81/TS1000 edgeboard wire-wrap connectors; keyed; bifurcated contacts; manufactured by TI; $5.00 each. Pc piggy-back extender boards; $1.50 each. Economical experimenting with Radio-Shack's 276-158 and 161 project boards and these connectors. Add $0.75 shipping per order. Paul Hunter, 1630 Forest Hills Drive, Okemos, MI 48864.

FOR SALE: MLI gives CWSS new life! Enter the program and view buffers using the speed of machine language. CWSS/MLI loads quicker because it's shorter by over 30%. Don't transmit your typos, delete them with MLI! I'm working on auto Tx/Rx and Rx screen dump to printer. Send me your suggestions on how you would like these to work. Most of all send your $7.50 for MLI! John McGinley N9BBN, 203 Milwaukee St, Mauston, WI 53948.

FOR SALE: KA2LHO HAM HELPER SERIES-13 ham radio programs from Novice Exams to electronics to County Hunting to antenna design, All written in easy to modify BASIC for the ZX-81, TS 1000, TS 1500, and TS 2068. This is one of the few complete lines of ham software availabvle for the 2068. For complete listing including 4 additional non-ham programs and misc. other hardware & software items, send a business size SASE to KA2LHO HAM HELPER SERIES, Kraig D. Pritts, 3421 Oneida St., Chadwicks, NY 13319

FOR SALE: MORSE CODE TEACHER II. UPGRADE UR LICENSE, TEACH NEW HAMS CODE CLASSES! ZX/TS-1000 teaches code fast! Sophisticated 8 1/2 K pgm sends perfect code audio at 1-20 WPM. Letters, numbers, punctuation. Random & stored text. Corrects your mistakes. Gives score. 9 practice options. Printer copy. Can key XMTR for auto CQ, etc. $8.95 for tape and doc. Clem Wehner K5KGM 2135A Willowwood, Scott, IL 62225. MONEY BACK GUARANTEE!

FOR SALE: 2K MORSE CODE TRANSLATOR for the TS1000/1500/ZX81. Program has two modes: 1)Code received through "ear" jack is scrolled across TV screen. NO HARDWARE MODIFICATIONS NEEDED. Up to 35 WPM. 2)Keyboard entries are changed into code which is available at "mic jack or TV speaker. Up to 100 WPM. This program was reviewed in June 84 issue of 73 mag. on page 92. $9.95+$1.00 S&H on cass. THOMSON SOFTWARE, PO BOX 1266, LOMBARD, IL 60148.

FOR SALE: (2) Timex 1016 16K RAM packs new and tested (schematic included) $15 each or trade for operating Timex 1000.

WANTED: IC1 2C158 (ULA) for T/S 1000 computer or will buy a junk computer with a good IC1. Bill Scott KA6PKL 947 Marin St.,Manteca, CA 95336.

WANTED: The book "The Complete Timex Sinclair 1000 & Sinclair ZX81 ROM Disassembly" by Ian Logan & Frank O'Hara. (502) 458-7324

Code Generator Addition
Cliff Efaw, K7HSX

In the Octoger QZX an article by KB4XH "Code Generator" had one omission and no instructions on loading

characters. Here is what I did to get it working:

Change line 3000 to 3001
3000 DIM(43,5)

Load program, use GOTO 3000, Enter the necessary numerals for the characters will run from 0 to Z. The 11th through 18th will be all 2's. Dit will be entered as 0, dah's as 1 and use 2 as a fill. For example, A would be 0 ENTER, 1 ENTER, 2 ENTER, 2 ENTER, 2 ENTER. The program will then print the five numerals you entered for a check. It is easier to do than explain.

BITS AND BYTES

50. KA6PKL gives some instructions on how to adjust the heads of tape recorders for more reliable loading. He suggests that an oscilloscope be attached to the head output and the alignment adjusted for maximun output. The scope should then be placed on the output of the tape recorder and the volume turned up until the sine wave becomes flattened. The control should then be backed off a bit.
51. KA2LHO replaced a chip in an interface but did not cure his problem. He said that the replacement chip was fine, but he did not have good solder connections on both sides of the board on each pin. Resoldering on both sides cured the problem.

BACK ISSUES

K2MI, 46 Magic Circle Drive, Goshen, NY 10924 still has some complete sets of back issues of the old QZX which was published before the current series started in December of 1982. There are a few scattered back issues left in the new series for 1984. We have a few of the big November 1983 special on RTTY at $2.00 each; the others are $1.00 per month to current subscribers. We are, however, completely out of the July and October 84 issues.

HELICAL ANTENNA DESIGN

by

Kraig D. Pritts-KA2LHO

Helical Antenna Design is the most recent addition to the KA2LHO Ham Helper Series of programs designed to put the Sinclair family of computers to use in the ham shack. The Series is available for all models of the Sinclair family and contain nearly twenty different programs for ham radio use. For information on the complete line of program in the Series, send a business size SASE to KA2LHO Ham Helper Series, Kraig D. Pritts-KA2LHO, 3421 Oneida St., Chadwicks, NY 13319.

To use this program from tape LOAD "HELICAL". Upon a successful load a title page will appear and move onto the initial information input. To use after typing from the listing, use RUN. You will need to provide your antenna center frequency, circumference in wavelength, number of turns, and pitch angle. After this initial information is entered the program will go on to make the necessary calculations and provide your data on the dimensions. Printer output is provided to the TS 2040, ZX, or other printer which recognizes the Sinclair LPRINT command.

If anyone would prefer not to type in the entire program it is available on a cassette as part of the KA2LHO Ham Helper Series described earlier. Send a check or money order (indicate which model of computer) for $8.00 to the address indicated previously (NY State residents please add appropriate sales tax).

This program should prove useful for those hams interested in antenna design. The helical antenna is especially well suited for the higher frequencies because of its relatively small size and portability. I hope that HELICAL ANTENNA DESIGN will be a useful addition to your library.

LISTING FOR HELICAL ANTENNA DSGN

```
   0 REM (C)1984,KRAIG D. PRITTS
KA2LHO, KA2LHO HAM HELPER SERIES
3421 ONEIDA ST., CHADWICKS, NY
13319
  10 CLS
  20 PRINT "     KA2LHO HAM HELPE
R SERIES",,,TAB 12;"PRESENTS",,,
"**********************************
**";TAB 31;"**     HELICAL ANTENN
A DESIGN     **";TAB 31;"********
**************************"
  30 PRINT ,,," ADAPTED FOR THE T
IMEX/SINCLAIR";"          FAMILY OF
 COMPUTERS",,,TAB 15;"BY",,,,TAB
 9;"KRAIG D. PRITTS",TAB 13;"KA2
LHO"
  40 PRINT AT 21,0;"(C)1984, KRA
IG D. PRITTS-KA2LHO"
  50 FOR X=1 TO 100
  60 NEXT X
  70 CLS
  80 PRINT "**********************
*************      INITIAL  INFOR
MATION      **********************
*************"
  90 PRINT AT 4,0;"YOUR CENTER F
REQUENCY (IN MHZ.) -> ";
 100 INPUT F
 110 PRINT F;" MHZ."
 120 LET P1=3.141593
 130 LET W=(INT ((3E08/(F*1E06))
*100)/100)
 140 LET WF=(INT ((W*3.2808)*100
)/100)
 150 LET W1=WF*12
 160 PRINT ,,"* ENTER A VALUE FO
R THE CIRCUM- * FERENCE OF THE H
ELIX(C LAMBDA)* IN WAVELENGTHS."
 170 PRINT "* (VALUES NORMALLY R
ANGE FROM)  * (ABOUT .9 TO 1.20.
    )"
 180 PRINT
 190 PRINT "YOUR C LAMBDA VALUE
-> ";
 200 INPUT CL
 210 PRINT CL
 220 LET CF=(INT (CL*WF*100))/10
0
 230 PRINT
 240 PRINT "YOUR NUMBER OF TURNS
-> ";
 250 INPUT N
 260 PRINT N
 270 PRINT
 280 PRINT "* ENTER A PITCH ANGL
E FOR THIS  * HELIX. NOTE: THE N
ORMAL VALUES* ARE BETWEEN 12 AND
 15 DEGREES."
 290 PRINT
 300 PRINT "YOUR PITCH ANGLE IS
-> ";
 310 INPUT A
 320 PRINT A;" DEG."
 330 FOR X=1 TO 30
 340 NEXT X
 350 CLS
 360 PRINT "**********************
*************      DESIGN SUMM
ARY      **********************
*************"
 370 LET AR=A/(57.29578)
 380 LET S=CL*TAN (AR)
 390 LET SM=(INT (S*W*100))/100
 400 LET SF=(INT (SM*3.2808*100)
)/100
 410 LET S1=SF*12
 420 LET L=(INT ((SM/SIN (AR))*1
00)/100)
 430 LET LF=(INT (L*3.2808*100))
/100
 440 LET L1=LF*12
 450 LET NS=N*SM
 460 LET NF=(INT (NS*3.2808*100)
)/100
 470 LET D=(INT (CL*W*100/P1))/1
00
 480 LET DF=(INT (D*3.2808*100))
/100
 490 LET D1=DF*12
 500 LET SL=S
 510 LET BP=INT (52/(CL*SQR (N*S
L)))
 520 LET BN=INT (115/(CL*SQR (N*
SL)))
 530 LET G=INT (15*CL**2*N*SL)
 540 LET R=140*CL
 550 LET GN=INT (10*(LN (G)/(LN
(10)))+.5)
 560 PRINT ,,"FREQUENCY = ";F;"
MHZ."
 570 PRINT ,,"CIRCUMFERENCE OF H
ELIX"," (C LAMBDA) = ";CL;,,,"WA
VELENGTH = ";WF;" FT."
 580 PRINT ,,"NUMBER OF TURNS =
";N,,,"PITCH ANGLE = ";A;" DEGRE
ES",,,"AXIAL LENGTH = ";NF;" FT.
"
 590 PRINT ,,"ANTENNA GAIN = ";G
;" (";GN;" DBI)"
 600 PRINT AT 21,0;" * PRESS [redacted]
[redacted] TO CONTINUE *"
 610 INPUT X$
 620 CLS
 630 PRINT "**********************
*************      DESIGN SUMM
ARY      **********************
*************"
 640 PRINT
 650 PRINT "MEASUREMENT   METERS
 FEET INCHES----------------------
------------"
 660 PRINT "WAVELENGTH    =";TAB
15;W;TAB 21;WF;TAB 27;W1
 670 PRINT "SPC BTWN TRNS=";TAB
15;SM;TAB 21;SF;TAB 27;S1
 680 PRINT "HELIX DIA.    =";TAB
15;D;TAB 21;DF;TAB 27;D1
 690 PRINT "LNGTH OF TURN=";TAB
15;L;TAB 21;LF;TAB 27;L1
 700 PRINT "----------------------
------------"
 710 PRINT "BEAM WIDTH (HALF POW
ER)=","  ";BP;" DEGREES"
 720 PRINT
 730 PRINT "BEAM WIDTH (AT FIRST
 NULL)=","  ";BN;" DEGREES"
 740 PRINT
 750 PRINT "TERMINAL RESISTANCE
= ","  ";R;" OHMS"
 760 PRINT "----------------------
------------"
 770 PRINT "DO YOU WANT A PRINTO
UT? (Y/N)"
 780 INPUT P$
 790 IF P$="N" THEN GOTO 1010
 800 IF P$="Y" THEN GOTO 820
 810 STOP
 820 LPRINT "**********************
*************      DESIGN SUM
MARY      **********************
*************"
 830 LPRINT ,,"FREQUENCY = ";F;"
 MHZ."
 840 LPRINT ,,"CIRCUMFERENCE OF
HELIX"," (C LAMBDA) = ";CL;,,,"W
AVELENGTH = ";WF;" FT."
```

```
 850 LPRINT ,,"NUMBER OF TURNS =
 ";N,,,"PITCH ANGLE = ";A;" DEGR
EES",,,"AXIAL LENGTH = ";NF;" FT
"
 860 LPRINT ,,"ANTENNA GAIN = ";
G;" (";GN;" DBI)"
 870 LPRINT
 880 LPRINT "-------------------
-------------"
 890 LPRINT "MEASUREMENT   METER
S FEET INCHES--------------------
-------------"
 900 LPRINT "WAVELENGTH    =";TAB
 15;W;TAB 21;WF;TAB 27;W1
 910 LPRINT "SPC BTWN TRNS=";TAB
 15;SM;TAB 21;SF;TAB 27;S1
 920 LPRINT "HELIX DIA.    =";TAB
 15;D;TAB 21;DF;TAB 27;D1
 930 LPRINT "LNGTH OF TURN=";TAB
 15;L;TAB 21;LF;TAB 27;L1
 940 LPRINT "-------------------
-------------"
 950 LPRINT "BEAM WIDTH (HALF PO
WER)=","  ";BP;" DEGREES"
 960 LPRINT
 970 LPRINT "BEAM WIDTH (AT FIRS
T NULL)=","  ";BN;" DEGREES"
 980 LPRINT
 990 LPRINT "TERMINAL RESISTANCE
 = ","  ";R;" OHMS"
1000 LPRINT "-------------------
-------------"
1010 PRINT AT 20,0;"DO YOU WANT
TO TRY ANOTHER ANT- ENNA DESIGN?
 (Y/N)"
1020 INPUT Y$
1030 IF Y$="Y" THEN GOTO 70
1040 STOP
1050 PRINT "START TAPE",,"PRESS
[redacted]"
1060 INPUT X$
1070 SAVE "HELICAL"
1080 SLOW
1090 RUN
```


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Presents

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48 K SSTV recieve,manual & sample of pictures at tape 29 USD p/p

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It's yours for: 220 USD p/p Blank 64 K Wafer at 5.40
Bland 128 K Wafer at 5.75 p/p

P.o.BOX 119 S-813 00 HOFORS, SWEDEN
(send large SASE envelope, with three IRC:s for info if rqd)

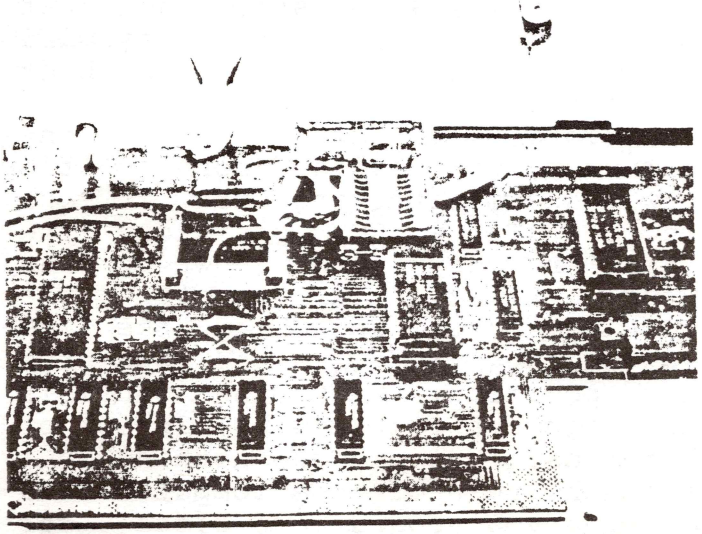
Spectrum Emulator

One of the biggest drawbacks of the 2068 is the selection of software available for it. Timex pulled out a bit too soon before a good selection of software became available. With the project I describe here, You can run many Spectrum (48K) programs on your 2068 (ones that normally don't run on your 2068)!

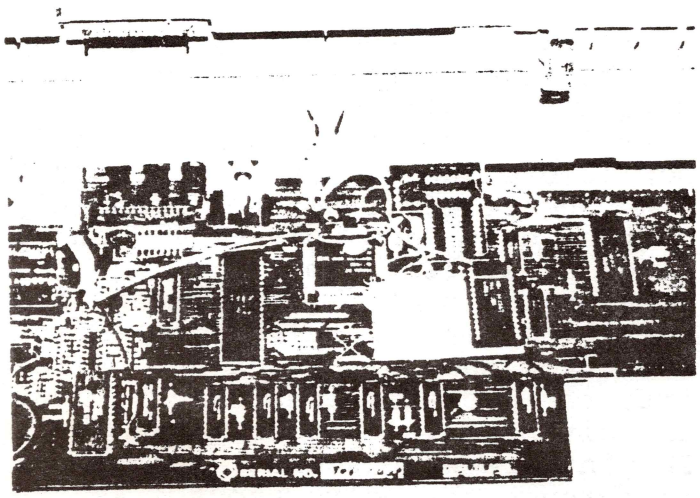
>>WARNINGS<< Do not attempt to make this your first project. It requires going inside the machine and removing an IC chip and replacing it with the board described here. Also remember that going into your machine probably will void your warranty.

Basically, what we're doing is replacing the 2068 ROM with the Spectrum ROM, which is all that you would have to do if you don't want to change between the two operating systems very often. The board that I describe here switches between the two ROMs so that you have immediate access to both operating systems at a flick of a switch.

The circuit board and schematic along with the pictures show the board, where it goes and how to make the necessary connections. Pin 27 is the chip select for the NEC ROM used by Timex and later model Spectrums. An earlier Hitachi Rom was used in the Spectrum and both machines allow the use of either ROM (the NEC and Hitachi ROMs have their pin 27 and pin 20 reversed). I take into account only the NEC ROM which should be the only one found in current 2068's and what is presently available for the Spectrum. The way you can tell is by the wire links used to the left of the Timex ROM (U16). The NEC ROM uses W1 & W2 shorted, and the Hitachi ROM uses W3 & W4 shorted. The ROMs are wired in parallel except for pin 27, which is wired as shown in the schematic. ROMCS (active low) comes from the ULA chip and selects the ROM when needed by going to a low state (0V). The switch selects the desired ROM by connecting ROMCS to that chip. The resistors, R, pull the unused ROM up to a high state (5V) so that it will remain inactive. Although probably not needed, C takes care of any transients (I feel better with it there). I used 10K ohm resistors, but anything from 4.7K to 10K can be used. Capacitor C can be 0.1 uF to about 4.7 uF, preferably tantalum.



Before...



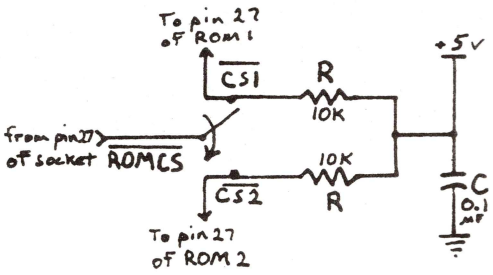
...and After Installation

Care must be taken when removing the chips and inserting them. The pins bend very easily and the chips are very static sensitive. One of the chips (I chose the 2068 ROM) needs to be mounted from the foil side and soldered in place. The other chip can be socketed. Room prevents the foil side ROM from being socketed.

Making the board can most easily be accomplished by taking the layout given here and having it copied onto clear acetate and then using a photo sensitive PC board (available at your local electronics shop), expose with your clear acetate copy and develop and etch following the instructions given with the process. All parts should be readily available.

BEFORE YOU START ANYTHING, UNPLUG AND DISCONNECT EVERYTHING FROM THE COMPUTER.

To assemble the board, first remove the seven screws securing the bottom of the computer and



carefully lift the top up till you see the keyboard connector, then carefully pull out the flatlead wire from the socket on the board. Now remove the Timex ROM, marked U16, (be carefull not to bend any of the leads) and place it in a piece of static foam.

From the picture, you can see that pins are required to stick down from the foil side to slide into the socket present on the 2068 circuit board. I used a three level 28 pin wire wrap socket and stuck it through the board about 1/4" and soldered them in place before clipping the leads from the top, through the center set of 28 pin holes. Next, install a 28 pin LP socket into the holes just offset to the right of the pins mounted before. Now stick the protruding pins into a piece of anti-static foam and mount the Timex ROM into the remaining holes taking care to allign pin 1 with the hole marked pin 1. Solder the resistors and capacitor in place and run three wires to a SPDT switch with the ROMCS wire going to the common of the switch and the CS1 & CS2 wires going to the outer tabs of the switch. I mounted the switch in the rear of the computer and physically set it so that the up position is for the Timex ROM. Check to make absolutely certain that there are not any solder bridges between any of the traces on the board.

Once you are sure that everything is OK, remove the anti-static foam from the pins and insert into the ROM socket on the 2068 board taking care to align pin 1 in the proper place (facing from the front of the computer, pin 1 will be left rear of the socket. The chip facing down will be to the left, as in the picture. Insert your new ROM into the socket of the Spectremulator with pin 1 in the same position as just mentioned. Mount the switch in a convenient place. Be carefull drilling into the case. For the top to sit down evenly again, a plastic tab that hangs down from under the keyboard must be clipped back about 1/8-1/4".

Before re-assembling the computer, go ahead and connect the power and monitor and turn it on. In the Timex ROM position, the familiar copyrights show up as usual. Allways turn off the computer before switching the ROM switch. Now try it in the Spectrum ROM position. Only the Sinclair copyright should show up! If one or both positions produce nothing but a crash, turn off the computer and examine your board more closely for shorts or breaks in the traces. Once you have it working properly,

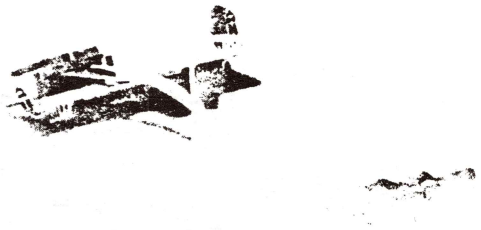
reassemble the computer taking care to gently re-insert the keyboard connector.

Once you are in the Spectrum mode, You will notice some differences in the operating system. FREE has been changed to: ~, STICK is now: |, ON ERR gives only: {, SOUND gives only: }, RESET gives only: @, and the word DELETE no longer appears. (Several of these characters do not print on our daisywheel printer.) Also the annoying stop-before- delete at every semicolon and line number is gone. Even though these commands are gone, they can still be used or made using IN & OUT and short routines. The joysticks still work with programs like Flight Simulator and Cyberzone while in the Spectrum mode. Sound can also be made using OUT and POKE (more on this next month). The command cartridge port does not work when in the Spectrum mode either. Otherwise, everything works exactly the same.

Things that do work include the 2040 printer and the 2050 modem. As far as software for the Spectrum is concerned, we have tried about seven that don't work on the 2068 but do work fine with the 2068 with the Spectrum ROM inside. They include all the software from Tasman (Tasword Two, Tasprint, & Taswide), Microprint 85 (you must CLEAR 65535 before loading) Pengy, Pool, and Cascade (contains 50 programs-some of these do run on the 2068). We have not found any that don't work yet. Just make sure that the software is for a 48K Spectrum. We will continue to order (and rent) software from Europe and keep you informed as to what we have found to work and is worth having. The Spectrum ROM is available from FOOTE SOFTWARE (see ad this issue) for $20. For software, check any British computer magazine you can get. They generally all list some titles.

With this addition to the 2068, you can open up a whole new avenue of support for your computer. With this we hope to be able to determine which peripherals for the Spectrum will operate on our 2068s including the microdrives now available in England!

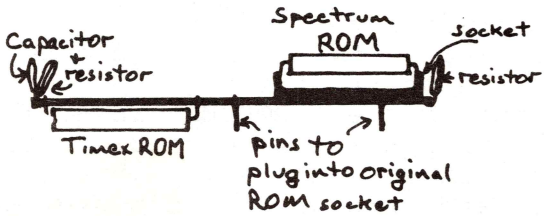
-- Joe Williamson



Spectremulator Board — Spectrum Rom is on the left and 2068 Rom below and on the right.

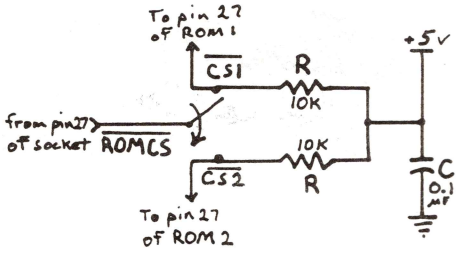
When installing the chips, always use great care in positioning the chips in the sockets. Generally, the width between the two rows of pins are wider than the socket spacing. To narrow the spacing, hold the chip with both hands, fingers holding top and bottom and press one of the rows of pins on their side onto a hard surface with the pins still in the protective foam. Carefully bend in both sides slightly until the chip is easier to fit into the socket. The outward bend of the pins help "force" a good connection to the socket, so don't over do it.

The foam is there to protect the chip from static discharges. Keep the chip in the foam as long as possible. Remember, the drier your climate, the more chance you have of



Front view of completed circuit board with both ROMS mounted.

...continued on next page

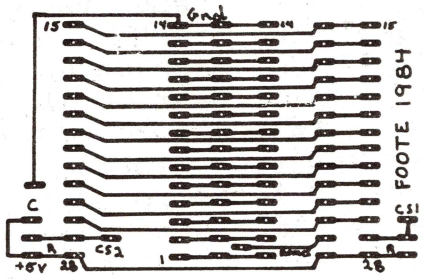


Schematic of Spectrum Emulator

static damage. Don't forget to protect the chips you take out such as the 2068 ROM. Your best bet is to stick it in the other side of the foam your new ROM is in. Also remember that in any work you do with any of your computers, you are working with static sensitive components; so be careful.

More software that we now know to work on the 2068 with the Spectrum ROM enabled include:

Tutankhamun
Teradacktil
Penetrator
Advanced Graphics
Chopper Rescue
Voice Chess
ETX
Code Name Mat
Groucho



Printed circuit layout for Spectrum Emulator.

Sometimes the Spectrum ROM has a hard time initializing. You can tell from the start if it will or won't. If the screen BORDER initializes white then no problem should occur. If the BORDER initializes black, go ahead and turn off the computer and try again. For me, it has trouble initializing about 20% of the time.

--Joe Williamson

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Note: 2068 versions are more than just "uploads", but are remakes containing full color and sound.

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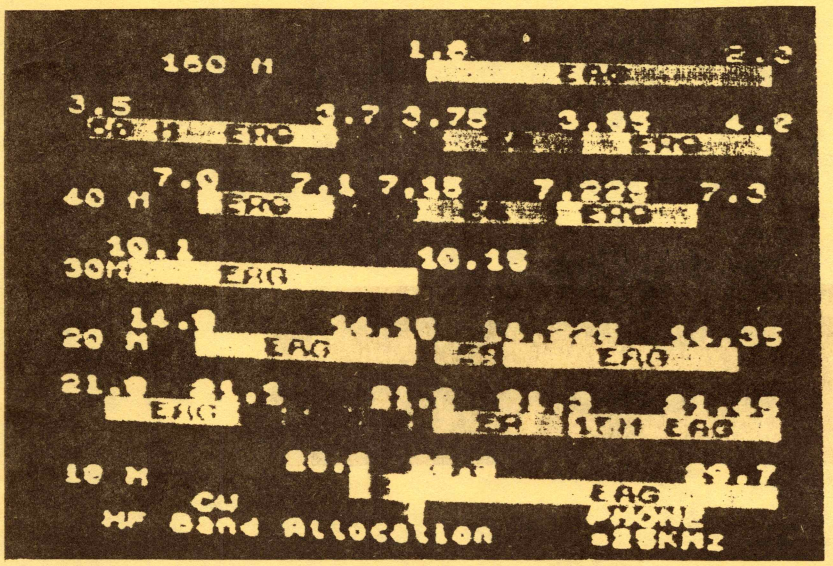
Dear Bo & Alex:

Here is a nice display of the HF Band Allocations of Amateur Radio that is for the TS2068 (or Spectrum). Unfortunately it only works with a color TV or Monitor...which all 2068 owners should be using anyway!

```
  1 BORDER 2: PAPER 1: INK 7: CLS : PRINT  AT 3,2;"WA6DLI from World Radio K6FO
"; AT 8,5;"AMATEUR BANDS (1 SEPT 84)"'''"   E = EXTRA CLASS"'"   A = ADVANCED"'"
  G = GENERAL"'"   N = NOVICE"
  2 PAUSE 400: CLS
  3 BORDER 1: PAPER 1: INK 0: CLS
  5 PRINT  INK 7; TAB 15;"1.8"; TAB 29;"2.0"
 10 PRINT  INK 7; TAB 4;"160 M    "; TAB 16; INK 0; PAPER 6;"      EAG      "
 15 PRINT : PRINT  INK 7; TAB 0;"3.5"; TAB 11;"3.7 3.75"; TAB 22;"3.85   4 0"
 20 PRINT  PAPER 2;"E"; PAPER 6;"80 M  EAG  "; PAPER 4;"EAGN"; PAPER 2;"E"; PAP
ER 3;"  EA  "; PAPER 6;"  EAG   "
 25 PRINT : PRINT  TAB 4; INK 7;"7.0   7.1"; TAB 14;"7.15"; TAB 21;"7.225"; TAB
 28;"7.3"
 30 PRINT  INK 7;"40 M"; INK 0; TAB 5; PAPER 2;"E"; PAPER 6;" EAG  "; PAPER 4;"
EAGN"; PAPER 3;"  EA  "; PAPER 6;" EAG  "
 35 PRINT : PRINT  TAB 2; INK 7;"10.1"; TAB 16; INK 7;"10.15"
 40 PRINT  INK 7;"30M"; TAB 3; INK 0; PAPER 6;"    EAG      "
 45 PRINT : PRINT  INK 7; TAB 3;"14.0"; TAB 12;"14.15"; TAB 19;"14.225"; TAB 27
;"14.35"
 50 PRINT  INK 7;"20 M"; INK 0; TAB 5; PAPER 2;"E"; PAPER 6;"   EAG    "; PAPER
 2;"E"; PAPER 3;" EA"; PAPER 6;"    EAG   "
 55 PRINT : PRINT  INK 7;"21.0"; TAB 6;"21.1"; TAB 14;"21.2"; TAB 20;"21.3"; TA
B 27;"21.45"
 60 PRINT  TAB 1; PAPER 2;"E"; PAPER 6;"  EAG "; PAPER 4;"  EAGN  "; PAPER 2;"E
"; PAPER 3;"  EA  "; PAPER 6;"15M EAG  "
 65 PRINT : PRINT  TAB 10; INK 7;"28.0  28.3"; TAB 28;"29.7"
 70 PRINT  INK 7;"10 M"; INK 0; TAB 13; PAPER 6;" "; PAPER 4;" "; PAPER 6;" ";
PAPER 6;"      EAG      "
 75 PRINT  FLASH 1; PAPER 1; INK 7;"      CW       < >       PHONE   ": PAUSE 10
0
 78 PRINT  AT 20,0; FLASH 0; PAPER 1; INK 7;"      CW       < >       PHONE   "
 80 PRINT  INK 7;"  HF Band Allocation   "; INK 0; PAPER 2;"E"; PAPER 1; INK 7;
"=25KHz"
 95 PAUSE 0: STOP
100 SAVE "HF BAND" LINE 0
```

Note: In lines 75 & 78, insert between the < >, a Graphic 5 to simulate < |



Bob

BOB HOWARD WA6DLI
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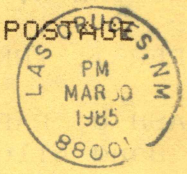
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